Recent Views on the Tonsil and Adenoid Problem

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Before commencing my paper on recent views on the tonsil and adenoid problem, I will take you back to ancient times and very briefly tell you something about the tonsil problem of those days.

In the reign of the Roman Emperor Tiberius there lived a man, Cornelius Calsus, who wrote an encyclopædia, in which, although not himself a medical man, he embodies a treatise on medicine. In his *De Medicina* he writes of "indurated tonsils," that they result from inflammation, and that as they are only covered by a very thin membrane, to remove them it is only necessary to separate them all round with the fingers and lift them out—in other words, enucleate them with the finger. Calsus goes on to say that "if this is not possible, the tonsils should be grasped with a hook and excised with a bistuory." There is a great smack of modernity in this brief monograph on the tonsils by this Ancient.

A writer in the seventh century gives a detailed description of how to stop post-operative hæmorrhage. For slight hæmorrhage he used a tepid decoction of brambles, roses, and myrtle leaves, but for excessive hæmorrhage some special type of earth was plastered on the area. He goes on to say that if on the following day the hæmorrhage has not stopped, the area should be anointed with the flowers of roses, saffron and starch, with milk, or with the white of an egg. If the area looked septic, honey poultices were used. Albucasis, an Arabian surgeon of the eleventh century, was probably the first to recommend the actual cautery as a means for the removal of the tonsils. Needless to say, it was not the electric cautery. Another method for removal tried much later was the application of a ligature round the tonsil, which was gradually tightened until the tonsil sloughed off. The rotting tonsil in the mouth is said to have infected the breath most horribly. A London surgeon wrote a book on surgery in 1768; after describing the crude methods used at that time when operating on tonsils, he winds up with the following: "This operation is not only too severe and cruel, but also too difficult in the performance, to come into the practice of the moderns, because of the obscure situation of the tonsils." When one considers the methods adopted and the fact that there were no anæsthetics then, I certainly agree with him. Much later the old type of guillotine came into use. Some of you will have seen it used and may have operated with it yourselves. Then came the modern guillotine, which was a great improvement, but it was not until Sluder invented the reverse guillotine technique that the tonsil could be enucleated with any degree of certainty.

And now to modern views on the tonsil problem. First—A very brief account of the anatomy and morphology. How does the tonsil originate?

The tonsil originates from a pouch in the neck called the second pharyngeal pouch. At first there is only the pouch, but later the entoderm lining of the pouch grows into the form of little buds, which become hollowed out and form what we know as the crypts of the tonsils. Lymphoid cells accumulate round the crypts and form lymph follicles, and so the tonsil becomes a mass of lymphoid tissue, and not a lymph-gland covered with a capsule, as is usually described.

I have shown the tonsil to be a mass of lymphoid tissue which develops in a pocket. This pocket formation can be traced back in comparative anatomy. The rabbit has a simple pouch with no tonsil in the cavity, the sheep has two cavities, while the dog, like humans, has tonsils projecting from the cavity. You may ask how can we prove the tonsils are developed from this cavity. The course of a congenital fistula of the neck is proof of this. People are occasionally born with this fistula opening in the side of the neck, and the opening can be traced right up to what is called the supra-tonsillar fossa, a fossa which represents the original cavity in which the tonsil developed. This congenital fistula roughly corresponds to what would be a gill in a fish.

The tonsil itself consists of two lobes, an upper and lower. These lobes fuse together, and at this spot are inserted the muscle-fibres of palatopharyngeus muscle. Where these fibres are inserted is generally the most difficult part of the tonsil to free during operation. Round the tonsil is the capsule, continuous with the capsule is a fold of mucous membrane, the upper part of this is called the plica semilunaris—in other words, the half-moon fold, and the lower part is called the plica triangularis, or triangular fold.

In the tonsil there are between twelve and twenty crypts—some of them penetrate as deep as the capsule; these crypts are lined with stratified epithelium, and as they are scantily supplied with mucous glands, anything entering them is not readily washed away by mucus, and the crypts are therefore easily filled with all sorts of bacteria and food particles, and may become an excellent medium for breeding of micro-organism. Normally the crypts empty themselves during the act of swallowing by the action of the pharyngeal muscle, which tightens on the tonsil and so expels matter from the crypts. All of you will have noticed this expulsion of matter at times when you put a tongue depressor far back in the mouth and make the patient wretch—the muscle tightens, shoots the tonsil out a bit, and expels matter from the crypts. The upper crypts, including the supra-tonsillar fossa, slope upwards, and are therefore at a disadvantage for draining. The lower are better placed for this. The half-moon and triangular folds of membrane I have already mentioned partly cover the crypts and may interfere with drainage; infection which causes congestion will have the same effect. The result is stagnation with accumulation of solid particles, giving rise to the fœtid cheese-like material in the crypts you are all familiar with. In chronic tonsillitis the crypts are shut off by scars caused by repeated infection, a blind abscess may thus form not unlike an apical tooth abscess.

I do not intend to take up your time describing the tonsil capsule or the pillars. It is very important, of course, that the pillars should be conserved absolutely intact during operation, as they play an important part in voice production and resonance.

Blood Supply.—Five arteries supply the tonsil, all derived from the external carotid. From the surgeon's point of view, the most important is called the tonsillar artery : it enters the lower lobe. They all break into small twigs as soon as they reach the inner aspect of the capsule. I suppose you have often wondered why bleeding, as a rule, stops so quickly after a tonsil operation. It is generally believed that spontaneous cessation of hæmorrhage during tonsillectomy is due to contraction of the pharyngeal muscle which forms the tonsil bed. It tightens in on the blood-vessels. It is doubtful if this alone accounts for it. It was pointed out recently that the tonsillar arteries possessed very powerful linings, just like the umbilical artery, and for this reason had phenomenal power of contraction, and that to a large extent is responsible for the stopping of hæmorrhage. But it is probably more often from the para-tonsillar vein that troublesome bleeding takes place.

Next, the Lymphatic Drainage.—It has been proved that the tonsil has no afferent lymphatic route. The fact that secondary deposits of carcinoma of the adjacent parts have not been found in the tonsils is one of the proofs, also it has been shown that pigment injected into the mucous linings of the nostrils reached the tonsils, not by the lymphatic route, but by way of the venous channel. The efferent vessels go to two sets of glands, one anterior and the other posterior to the sterno-mastoid. Both anterior and posterior send vessels to an inferior group, then via the thoracic glands to the thoracic duct, and then straight into the general circulation. By this route infection is carried to all parts of the body. Tuberculosis infection of the apices of the lung may take place via the tonsil.

Nerve Supply.—I shall pass over the nerve supply, except to mention that the lingual and glosso-pharyngeal are both liable to injury during tonsillectomy, especially if the technique is faulty.

Physiology.—I will briefly give you the most recent views on the functions of the tonsil. It is now thought that until it becomes diseased it may be of some use. It is thought that the tonsil probably is a filtering structure; within its tissue and its crypts bacteria are not only destroyed, but a vaccine is also prepared. It may be regarded as a culture-tube for preparing a vaccine; this vaccine deals first with the invading bacteria, and is then discharged through the efferent lymphatic vessels of the tonsils into the general circulation.

That is all right for the healthy tonsil, but if, however, more bacteria are absorbed than the tonsillar laboratory can deal with, then the vaccine-preparing property of tonsil breaks down and germs are discharged straight into the system together with their toxins, so you see that in the diseased tonsil bacteria have direct access to the circulation and may thus become a possible portal of systemic infection.

The question of whether the tonsil is an endocrine organ has long been debated. Peller of Vienna states he can now prove it is definitely so, and attempts to do so by statistics. He examined several thousand children of from fourteen to sixteen years of age. From this material he made the following observations :—

1. Tonsillectomized young people are on the average larger and heavier than those with enlarged tonsils.

2. Bust measurement in girls is about 2 cm. greater in tonsillectomized cases than in subjects with hypertrophied tonsils.

3. That there are nearly twice as many tonsillectomized persons among blondes as among dark-haired subjects.

4. Those who have been tonsillectomized menstruate about a year earlier than those with hypertrophied tonsils. Peller concludes that tonsils may be regarded as inhibitory to growth, and that inhibitory impulses are much greater from hypertrophied tonsils. It is generally thought while these statistics are interesting they are hardly convincing.

Bacteriology of the Tonsil.—Cultures made from the throat within twelve hours after birth are almost always sterile. Organisms begin to appear soon after nursing commences. The hæmolytic streptococcus is never found in the healthy throat of infants, staphylococcus non-hæmolytic being found. The consensus of opinion is that the hæmolytic streptococcus is found in about sixty to eighty per cent. of normal adult throats, the carrier himself being immune to it under normal conditions. One can look upon the essential cause of tonsillitis either as an increase in virulence of the cocci already present, or a decrease in resistance of the patient. In chronic diseased tonsils the hæmolytic streptococcus will be found in about ninety per cent. of cases. In acute tonsillitis and quinsies, hæmolytic streptococci are the predominating organism, and are found in the crypts in almost pure culture. In fact, it is generally accepted that a tonsil culture lacking hæmolytic streptococcal colonies would be strong evidence against a diagnosis of acute follicular tonsillitis, and in favour of some other infection such as diphtheria or Vincent's angina.

A focus of infection may be present in a tonsil for many years without causing any visible disturbance, until suddenly symptoms of a systemic disease develop. The consensus of opinion is that tonsillectomy definitely clears the throat of offending microbes causing systemic infection, but that tonsillectomized patients may get acute throat affections due to hæmolytic streptococci : these organisms, however, rapidly disappear after the inflammation has subsided.

Tubercule Bacillus and the Tonsil.—The occurrence of tubercle in the tonsil has variously been given as being between 1.6 to 5 per cent., but it is in all probability less than that. Some authorities say it will be found in about forty per cent. of cases suffering from phthisis. The infection reaches the tonsils either by the blood or via the septum. Primary tuberculosis of the tonsils is rare. There is a definite

relationship between tuberculosis of tonsils and cervical adenitis, whether the tonsil be the primary or secondary seat of infection. It is claimed that in fifty per cent. of cases of cervical adenitis a prompt recovery takes place after tonsillectomy. The relationship between tonsils and pulmonary tuberculosis is not close enough to advocate the removal of tonsils in this condition.

What constitutes a diseased tonsil and what are the means of ascertaining it?

(1) *Size.*—It is now universally admitted it is not the size of the tonsil that matters, but its septicity, and this may prove to be of a high degree in a small tonsil. At times a highly infected tonsil may be almost invisible. Of course, in the large majority of cases the enlarged tonsil is septic, but even in the odd case where it is not septic, if it is so large as to interfere with breathing, operation is indicated.

(2) *Redness.*—Redness of the tonsil and anterior pillar is a more reliable sign than the size. A narrow, sharply limited, and very dark red zone on the anterior pillar is typical of a predominatingly streptococcal infection in the tonsil, while a zone not so red, broader and fading off gradually, is diagnostic of an infection in which streptococci do not predominate, the predominating organisms often being staphylococci. In this latter type one does not expect to find a history of arthritis, neuritis, and the like.

(3) *Pus.*—But to arrive at a certain diagnosis, the demonstration of pus is essential. It often requires very careful examination to demonstrate pus. To begin with, the semilunar and triangular folds I mentioned may be covering the tonsil like a curtain, and therefore hiding the tonsil proper from view; also the infection may be deeply seated.

To get a good view and in order to show a deep-seated infection, two tongue depressors may be used, one to depress the tongue and the other to retract the anterior pillar. Gentle pressure is then put on the tonsil with the latter, and the crypts will open and their contents squeeze out—these may be either plugs or liquid pus.

There are different kinds of plugs—the dry, crumbling plugs, which on light pressure shoot from the tonsils and often contain chalky concretions, are not considered of much pathological signficance; but the semi-solid plugs, offensive to the smell and yellowish in appearance, often contain a great deal of pus. The yellowish discharge which escapes from the infected tonsil in a constant stream is generally pure pus. In our zeal to demonstrate pus we must not exercise too much pressure on the tonsil, because this may produce a thin lymphatic discharge from the supra-tonsillar fossa, due to tissue-lymph and lymphocytes escaping through the torn thin lining of the crypts. The bacteriologist is often a great help in these cases, but the demonstration of pus by whatever method lets us know we are dealing with a diseased tonsil.

Pus may not be demonstrated by all the means at our disposal, and yet the tonsil be severely infected and be a focus of systemic disease, the infection being deep-seated in the crypts and shut off by scars and adhesions, thus escaping clinical observation—this is confirmed by sections made from apparently healthy tonsils, after tonsillectomy, which often show blind abscesses in the parenchyma. The local examination of the tonsil obviously does not always permit us to arrive at a certain diagnosis. It is most important that the previous history of the patient along with his general condition be taken into consideration. If general examination points to frequent tonsillitis and quinsies, and yet the tonsil looks healthy, or if it points to a systemic disease such as rheumatism, neuritis, etc., and other more obvious foci such as teeth infection are not discovered, one would be fully justified on looking upon the tonsils as the probable source of the trouble, no matter what the local examination of it might have revealed. Tonsillectomy is the only logical step, the more so, as it is generally agreed that the harm done, if any, in removing a healthy tonsil is so infinitesimally small as compared with the danger of keeping a structure which is harbouring bacteria and producing pus.

A note of warning—In practically every case, before tonsillectomy is decided upon it is necessary to exclude sinus disease, as this may be at the root of the trouble and be responsible for the infected tonsils.

General Indications for Tonsillectomy.

(1) Large tonsils which are definitely not infected should not be removed unless causing interference with breathing or swallowing. If not very marked, delay if possible until the age of four.

(2) Tonsils shown to be infected, either by direct demonstration of pus or by inference (after the exclusion of nasal sinus disease), should be removed regardless of the patient's age.

A colossal literature has accumulated to show that the infected tonsil is a focus which gives rise to :—

First—*Local Infection,* such as tonsillitis, quinsies, retropharyngeal abscesses, middle-ear disease, etc.

Second—*Systemic Diseases,* of which about forty or fifty are known :—

(1) Rheumatic and arthritic diseases.

(2) Glandular diseases—cervical adenitis, toxic goitre.

(3) Infectious diseases—scarlet fever, diphtheria.

(4) Alimentary diseases—dyspepsia associated with toxæmia, duodenal and gastric ulcer.

(5) Respiratory diseases—bronchitis, tuberculosis.

(6) Heart and kidney disease.

(7) Chorea.

(8) Iritis and associated diseases of the eye.

(9) Skin diseases—urticaria and herpes.

(10) Diseases due to allergy—asthma, hay-fever, etc.

End-Results of Tonsillectomy.

Often it is difficult to access the merits of tonsillectomy clinically, as the full benefits of the operation cannot always be determined at once, nor is it possible to say with certainty what would have happened had the operation not been performed. Many investigators have produced statistics. In each case about two to three thousand children who had their tonsils removed were compared with a similar number of unoperated children of like age and similar pre-operative symptoms, who had been recommended for operation but for various reasons had not had the operation. The children belonging to both groups were examined after an interval of three to ten years respectively. The general summing-up of the end-result of the tonsil and adenoid operation was as follows :—

(1) Effect on general health : nearly always good.

(2) Effect on general condition of throat, nose, and chest : good.

(3) Effect on hearing : good.

(4) Effect on aural discharge : usually good, but often negative, if it is chronic.

(5) Effect on mouth-breathing : nearly always good.

(6) Effect on cervical glands : nearly always good.

(7) Effect on nasal discharge : often good, but fails in many cases to give immediate improvement.

(8) Liability to infectious disease : rather less liable to those where tonsillitis is usually found.

(9) Liability to acute ear infection : incidence much lessened.

All investigators agreed that incomplete tonsillectomy did not offer the same protection as complete removal of tonsils. It may actually leave the patient in a worse condition than before, because the part left behind scarifies, and if there is any infection present in the tonsillar crypts, these are promptly sealed up, and drainage which may have existed before the operation is now interferred with.

Contra-Indications for the Removal of Tonsils.

Operation should not be performed in the following conditions :—

(1) Hæmophilia, for obvious reasons.

(2) Blood diseases such as Hodgkin's disease and pernicious anæmia, because they predispose to bleeding.

(3) The lymphatic state, because of the enlarged thymus which is usually present and consequent danger.

(4) Arterio-sclerosis, as it predisposes to bleeding.

(5) Abnormal enlargement of blood-vessels, as evidenced by a pulsating swelling in the neighbourhood of the tonsil.

Then in the following cases operation is only to be performed after the conditions stated have subsided :—

(1) Acute local and general infectious diseases, e.g., acute colds, tonsillitis, acute otitis media, acute bronchitis, acute nephritis, etc.

(2) Menstruation and pregnancy.

Whether quinsies should be included in the list is now controversial.

I do not intend to take up your time describing the various methods of operating. The old controversy always arises—whether guillotine or dissect. Each method has points in its favour, and the person who claims that either one is the only method to adopt is obviously unable to perform the operation by the other method. Operation by guillotine is a ' nacky ' operation, and many brilliant aural surgeons have never been able to master it. But even the very best guillotine operator will find occasions when it is necessary to use the dissection method to be certain of success.

Again I should like to impress the necessity of having the teeth attended to before operation, the removal of any loose ones, and also to make certain there is no sinus trouble.

PHARYNGEAL TONSIL.

The pharyngeal tonsil is situated in the naso-pharyngeal space, and any abnormal development of it produces what we call adenoids. Adenoids were discovered about 1870, although Hippocrates very nearly detected them, remarking that when people walked about with their mouths open and with running ears and a hard palate like the inside of a saddle, they frequently had some growth at the back of the nose.

The function of the pharyngeal tonsil is similar and accessory to the function of the palatine tonsil. When the pharyngeal tonsil is unable to overcome general and local infection, it becomes enlarged, thus the lymph-tissue is replaced by fibrosis, producing adenoids. It is then a breeding-ground for bacteria and thus a focus of infection. Heredity and malnutrition play a part in the production of adenoids. Adenoids may accompany enlargement of the faucial tonsils, but are often present without undue enlargement of these tonsils. Adenoids alone can either by their bulk or because they are infected produce many symptoms. On account of their bulk they may be responsible for nasal obstruction, deafness, retarded mental development, malocclusion of teeth, etc.; in short, the typcial long-shaped, stupid-looking face with protruding upper teeth, with which we are so familiar.

Infected adenoids can cause cervical adenitis in the posterior triangle, nasal discharge, colds, croup, bronchitis, asthma, otitis media, and systemic infection.

How to examine for adenoids.—Adenoids can be seen with a post-nasal mirror, but if you are not experienced with it, it is better to put the finger into the post-nasal space and feel if there are any there, care being taken to have something between the teeth to prevent the child biting the finger. But the diagnosis can often be made by inference; signs such as glands in the post-triangle of the neck, retracted drum in the ear, mucous plug from the naso-pharynx when the patient is made to gag—all these point to adenoid affection.

Clinical symptoms, after excluding nasal obstructions, such as nasal speech, mouth-breathing, snoring, etc., also point to adenoids.

Adenoids should be removed, no matter how young the patient is. Some children are born with a pad of adenoid tissue which interferes with the baby's breathing and produces discharge from the nose. The modern tendency is to discard the view held formerly, that when the adenoids are removed the tonsils should in all cases be removed at the same time, ostensibly to obviate a second operation. Admittedly the two as a rule go together, but if there is no evidence of the tonsils being infected or grossly enlarged it is better to remove adenoids only, especially if the child is under four years old. The presence of an enlarged tonsillar gland in the anterior triangle is a definite indication that the tonsil is also infected.

I do not intend to say anything about the operation, except to stress how important it is to achieve a clean result and also not to injure the opening to the eustachian tubes and probably set up otitis media, or through the scarring produce deafness. Nasal speech and regurgitation of food through the nose occasionally follows this operation. This is due to the extra room in the pharynx, produced by the removal of the adenoids. Often in those cases a bifid uvula is present, which is the first stage of cleft palate. It may take several months before the voice looses the nasal twang. In the old days this operation was attempted by the finger-nails, and an artificial finger-nail was actually used.

Do Adenoids Recur?

There is no unanimity on this question. Some definitely say they do, others deny it emphatically. It would be safe to assume that even after a complete operation a small portion of patients show a recurrence. It is generally admitted that breathing exercises, by causing a proper aeration of the posterior nasal-space, help materially to diminish the percentage of adenoid recurrences.